[redacted] 25X1

TECHNICAL PROPOSAL

NO. TP 5500-2.11

THE STUDY AND APPLICATION OF IMPULSE LINE GENERATORS FOR TESTING OF

[redacted] SYSTEM 25X1

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TECHNICAL PROPOSAL NO. TP 5500-2.11

FOR

THE STUDY AND APPLICATION OF IMPULSE LINE GENERATORS FOR TESTING OF [redacted] CRYSTAL VIDEO RECEIVING SYSTEM

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1. PURPOSE

This proposal relates to the application of impulse line generators for the testing of a D. F. Crystal Video System from the point of view of balance, sensitivity, changes in amplifier response, or functional operation of indicating devices. It has the advantages of simplicity and reduction of power supply requirements, and can be mounted directly upon the mast, eliminating the use of R. F. Cables and their resultant attenuation. It also has direct calibration without employing expensive attenuators, requires no tuning elements, plus relatively low cost and small size and weight. Since it employs the use of a mechanical oscillator, a periodic program of preventive maintenance is specified for every 100 hours of operation (approximately every six months).

The following are the major items which would result from this program:

(a) evaluation of various types of impulse line generators for checking all bands with filters in the Crystal Video Receiving System.

(b) specifications to the [redacted] on requirements of the electronic circuitry for proper operation of the impulse lines

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(c) integration and packaging of test system with over-all antenna and detector program currently under design at [redacted]. 25X1

(d) construction of three complete test systems as required.

2. MAJOR DETAILS OF THE PROPOSED PROGRAM

The use of a series of impulse lines to cover all bands, including filters, along with adequate switching to minimize the number of units required is herein proposed. The output circuitry required for evaluation of sensitivity, balance, etc. would be furnished by the [redacted]. 25X1

A system employing impulse lines in this application has been successfully used up to 12 KMC. Environmental tests made on the units involved have indicated a maximum of 1 db variation from approximately -35° to $+70^{\circ}$ C.

Although a number of lines as manufactured by various companies will be involved in this development, the fundamental theory of all the units is very similar. The impulse generator is basically a coaxial line with a movable center conductor. The inner conductor makes contact at either end depending upon which of the coils at the ends of the line is energized. In one position the line is charged to a pre-set potential, and in the other position it is discharged to an impedance equal to that of the line. This gives rise to a pulse output that is basically rectangular in shape and a fraction of a milli-microsecond in duration. Theory indicates that a pulse of this nature has an amplitude spectrum given by

$$A(f) = HT \frac{\sin nfT}{nfT}$$

H = Pulse Amplitude
T = Pulse Duration

This function is characterized by essentially a flat response to 1/10 of 1/T. The power output of the line is then proportional to the charging voltage, resulting in a simple and accurate method of calibration.

Prior investigation indicates that the following impulse lines could be employed for optimum coverage of all nine bands:

The Stoddart Aircraft Radio Co., Inc. mercury-contact-type impulse generator would be evaluated in bands one to five, along with the type 90857-1 as manufactured by the same company.

This latter unit could well be employed in bands six and seven, and, as already mentioned, is currently being used in a similar application.

Bands eight and nine would require considerably more development and evaluation, but it appears that lines recently developed by the Empire Devices Products Corporation would have more than adequate power output to test these bands, even with filters, due primarily to the large bandwidths involved.

The table below indicates the approximate output of these lines at various frequencies, in microvolts per megacycle of bandwidth assuming that maximum charging voltage is employed.

Freq. KMC	Mercury Contacts (Stoddart)	90-857-1 (Stoddart)	Empire Devices Products Type A	Type B
1	100,000	10,000		
10		780		
20			1,500	1,000
40				1,000

All of these units are relatively small and no problems are

envisaged in integrating them into over-all packaging of the antenna system.

3. PHASES OF THE PROGRAM

It would be convenient to divide the program into two distinct phases.

Phase I would be devoted to the evaluation of the various lines with respect to the available energy in each band plus the environmental evaluation of the lines, variations in output, life testing, etc. This phase would also include the determination of the optimum coaxial switching required from the point of view of minimizing the total number of lines employed, plus the simplification and maximum reliability of the test setup. This would also involve determination of the optimum method of probe injection from the point of view of accessibility and stability.

Phase II would involve the packaging, integration, and construction of the test function with respect to the over-all receiving system.

4. CONCLUSION

A system for test and evaluation of the Crystal Video Receiving System has been proposed. A reasonable amount of development is involved primarily because of the limited bandwidths at the lower frequency bands, plus the reduced spectral output at the very high frequencies involved.

Close liaison would be required between [redacted] 25X1 Corporation with respect to the transmission and interpretation of data, and the establishment of final system packaging. The

proposed system offers certain specific advantages, and its incorporation in a receiver having such a wide frequency coverage would offer a distinct advancement in the field of testing and signal simulation in crystal video receiving systems.